

# Towards the Establishment of a BIM-supported Facility Management Knowledge Management System for Energy Efficient Building Operations

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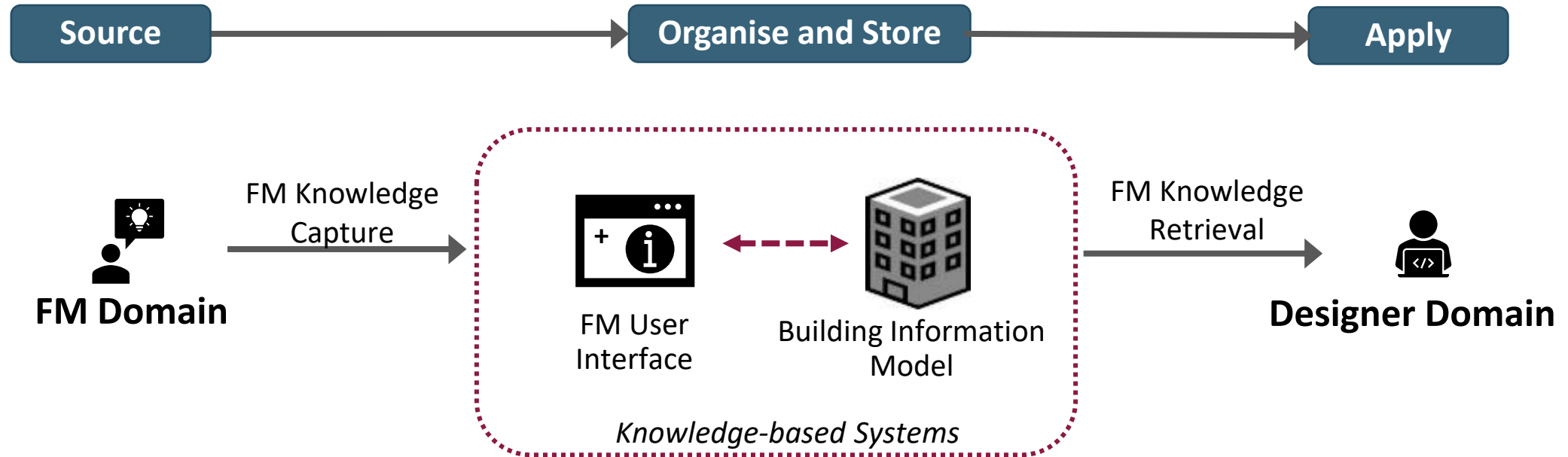
- The operation of buildings is responsible for 40% of the total final energy consumption, meantime over 70% of existing buildings consumes more energy than necessary.
- The domain of **Facility Management (FM)** possess a significant amount of knowledge about how to minimize the operational building energy-use, **via small and middle scale energy retrofitting**.

**When buildings are re-designed, traditionally the consideration of FM knowledge has often been ignored or stay at minimum at best.**

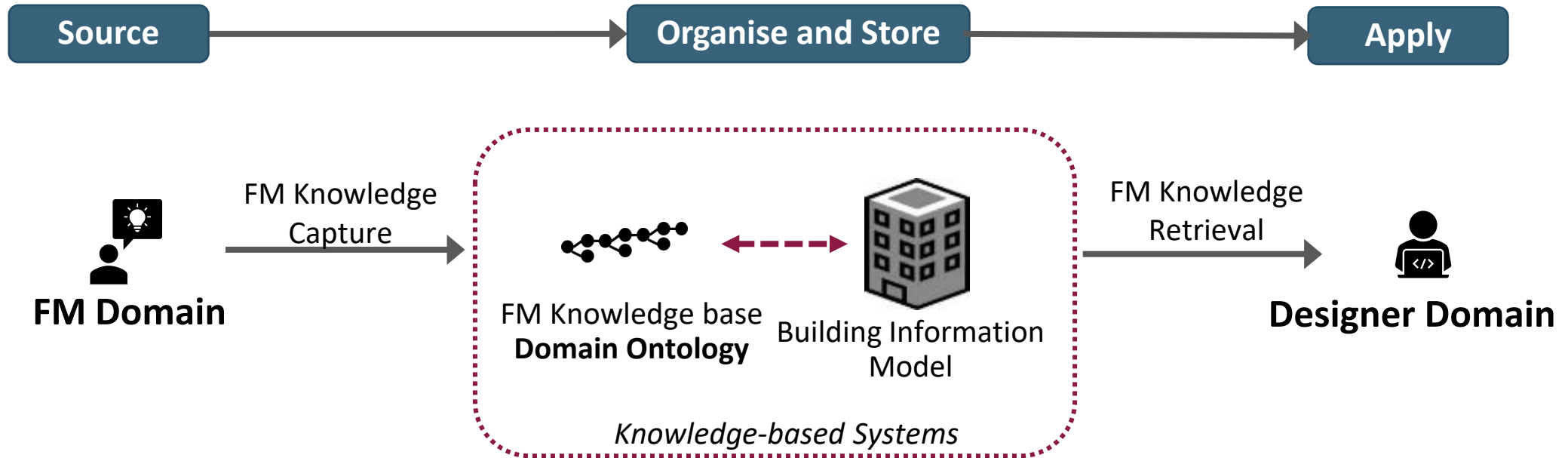


- **Knowledge Management (KM)** is a relatively new management field that could be described as a **conscious strategy** of getting the right knowledge to the right people at the right time to improve organizational performance.



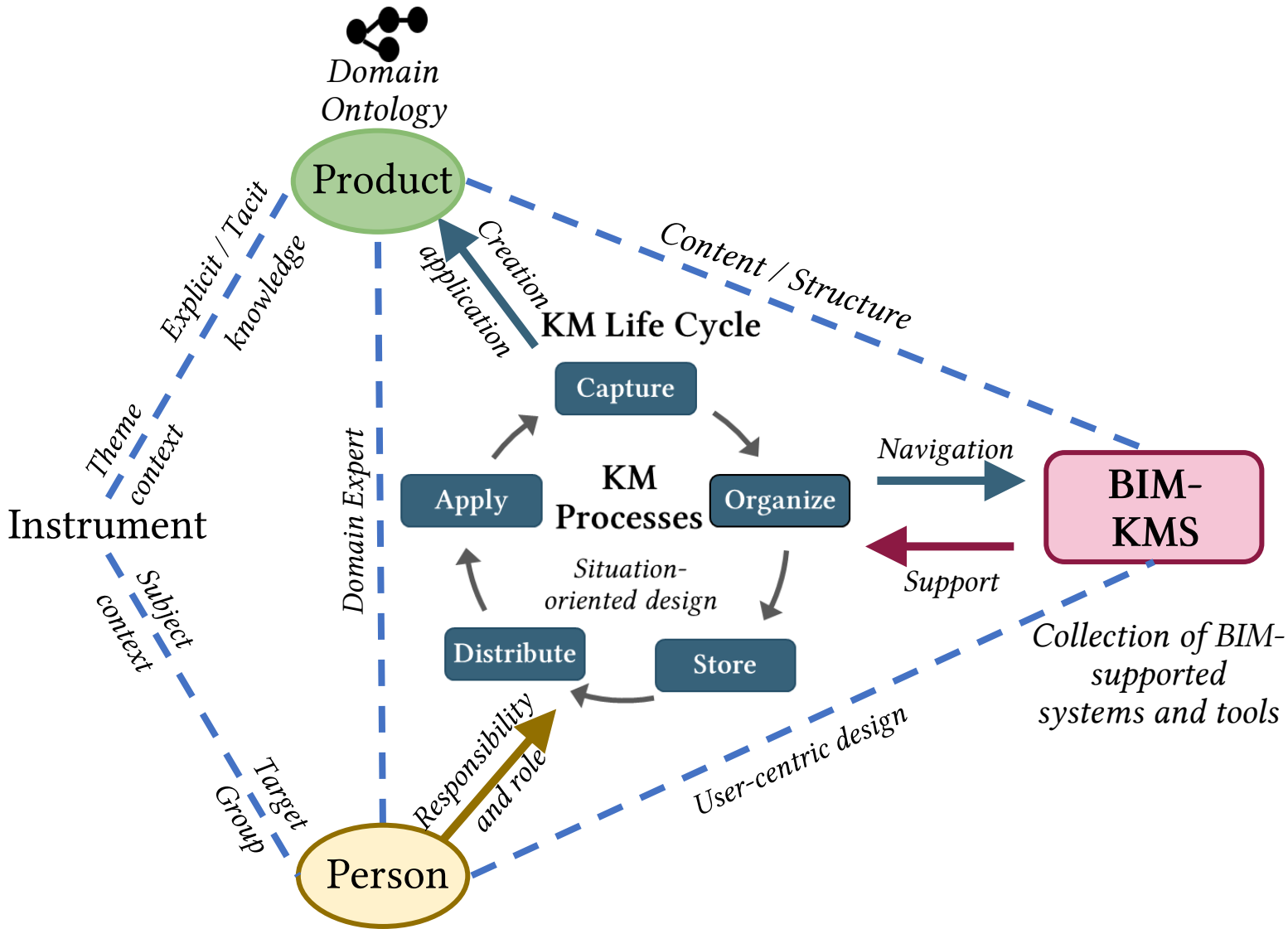


- The focus point of developing a BIM-KMS is on:
  - building up **BIM-supported knowledge bases**, tools, or computational systems, or
  - the **overall KM processes** that are aided by BIM-supported systems and tools.



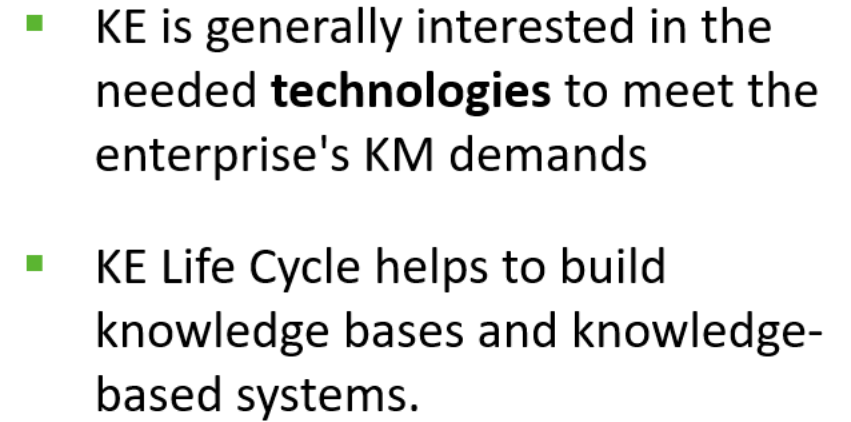
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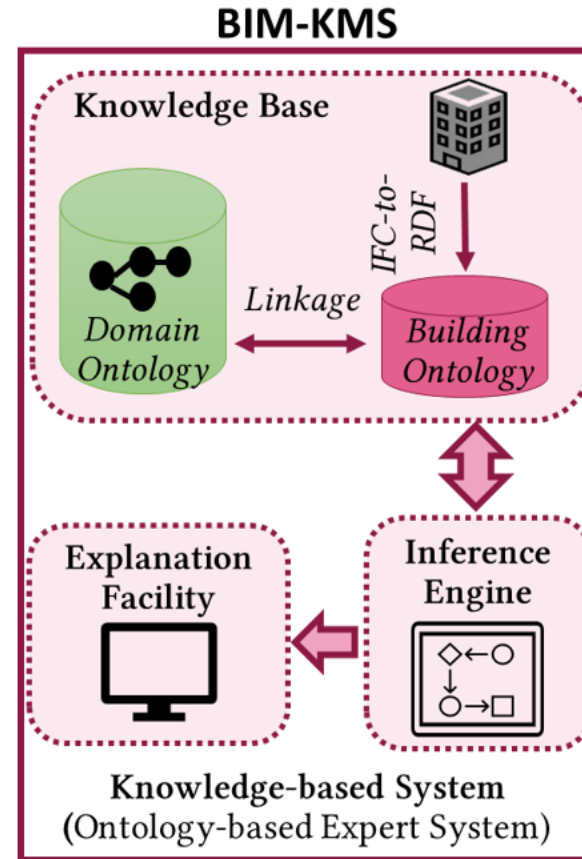
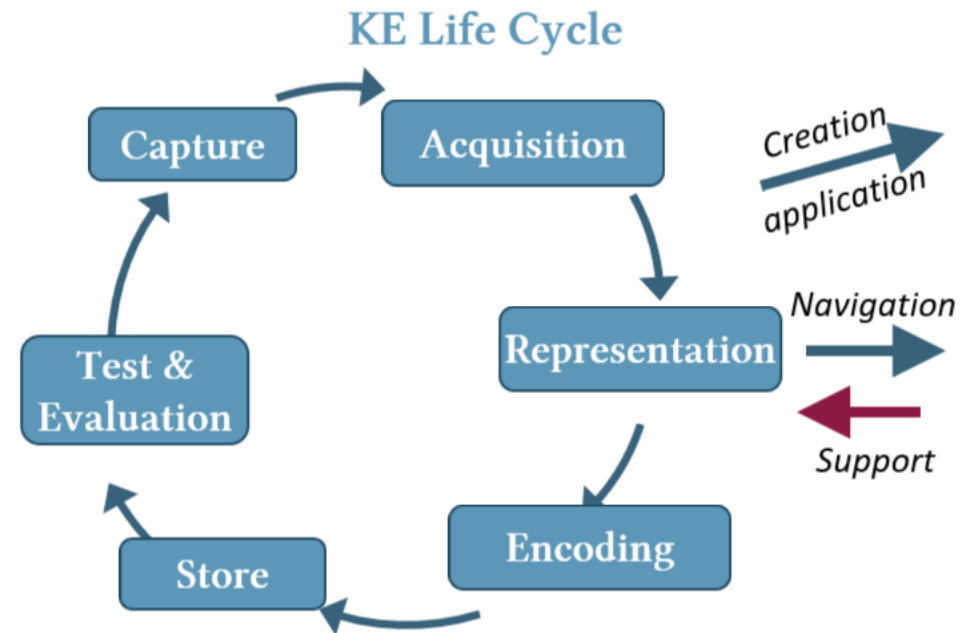
# The Knowledge Management Approach



- KM is primarily concerned with leveraging knowledge by establishing an **enterprise-level** KM strategy.
- Within KM, **modeling** is one of the critical tasks that help to understand and analyse the main perspectives of the KM initiative.
- This **modelling** can occur by the **help of ontologies**, thus creating a so-called **enterprise ontology**.

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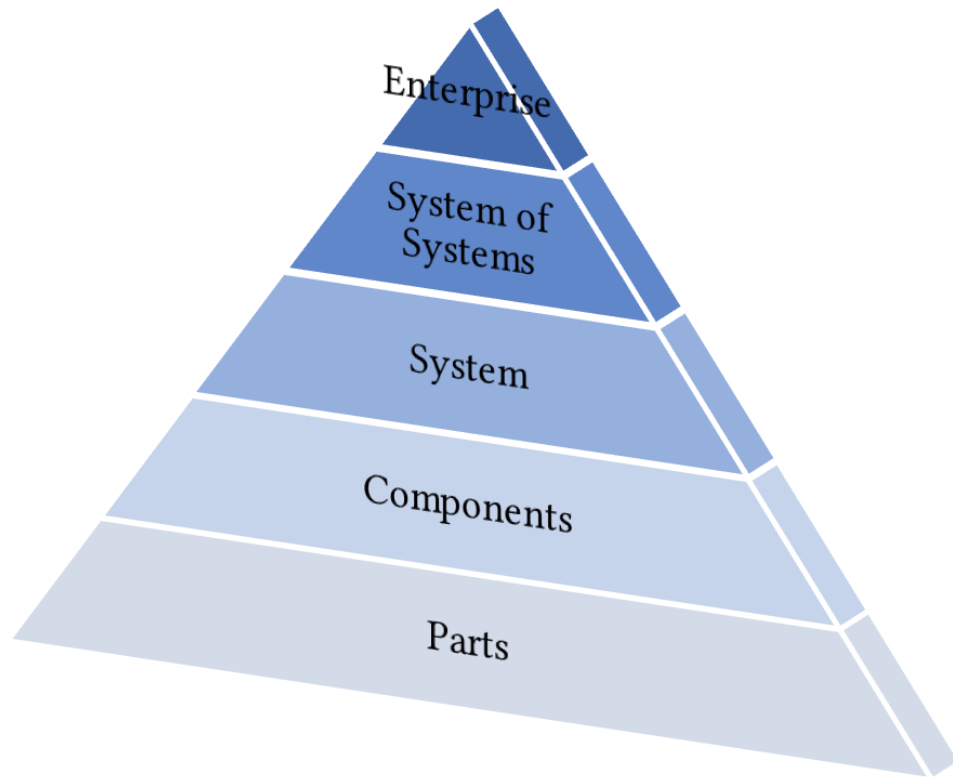




- KE is generally interested in the needed **technologies** to meet the enterprise's KM demands
- KE Life Cycle helps to build knowledge bases and knowledge-based systems.
- Ontological Engineering is the predecessor of KE, that aim is to develop **domain ontologies**.
- This domain ontology together with the BIM Model, (the knowledge base) can be used for **computational inference (i.e. reasoning) purposes**.

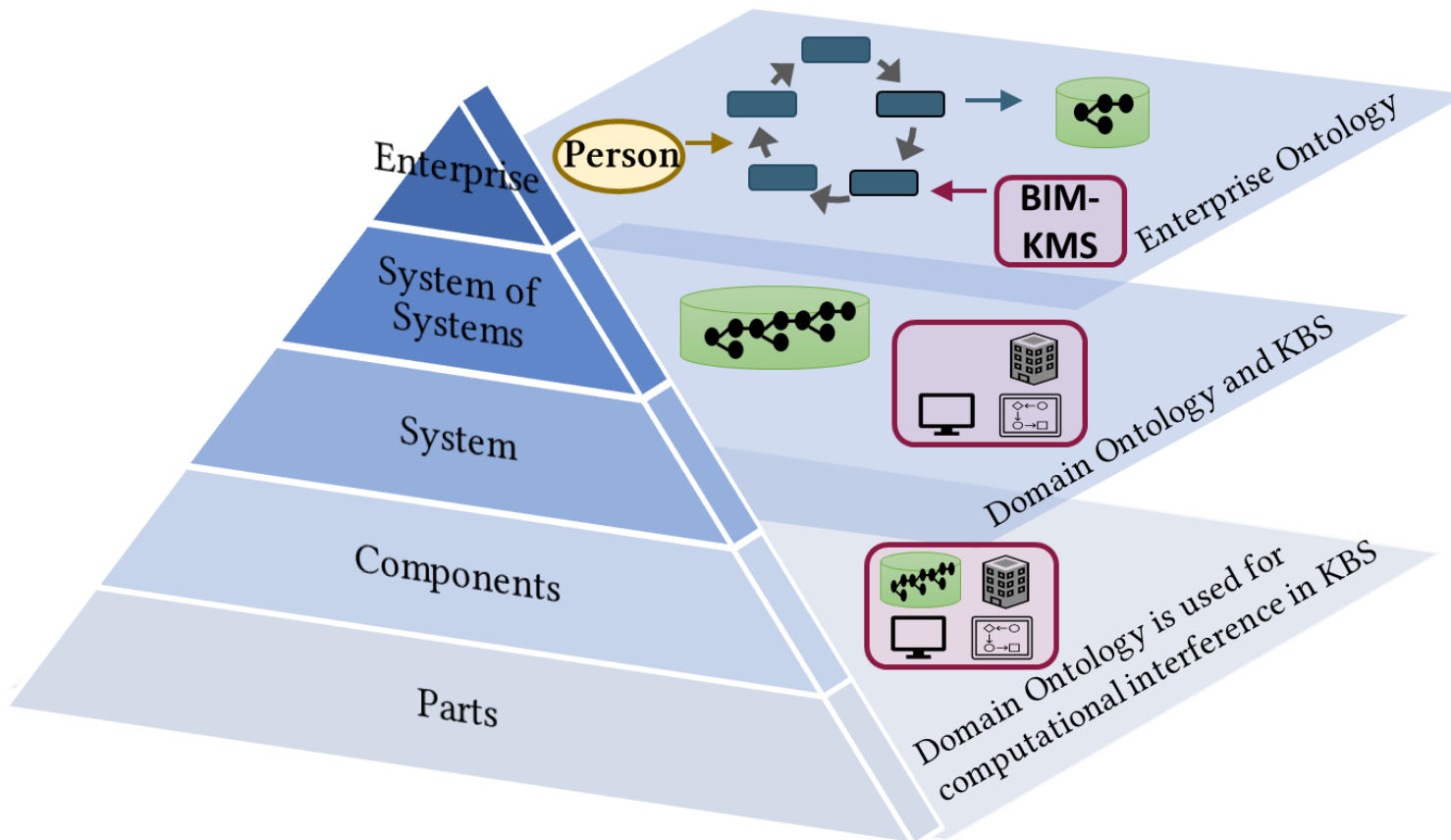


# System Engineering Principles in Developing BIM-supported Knowledge Management Systems



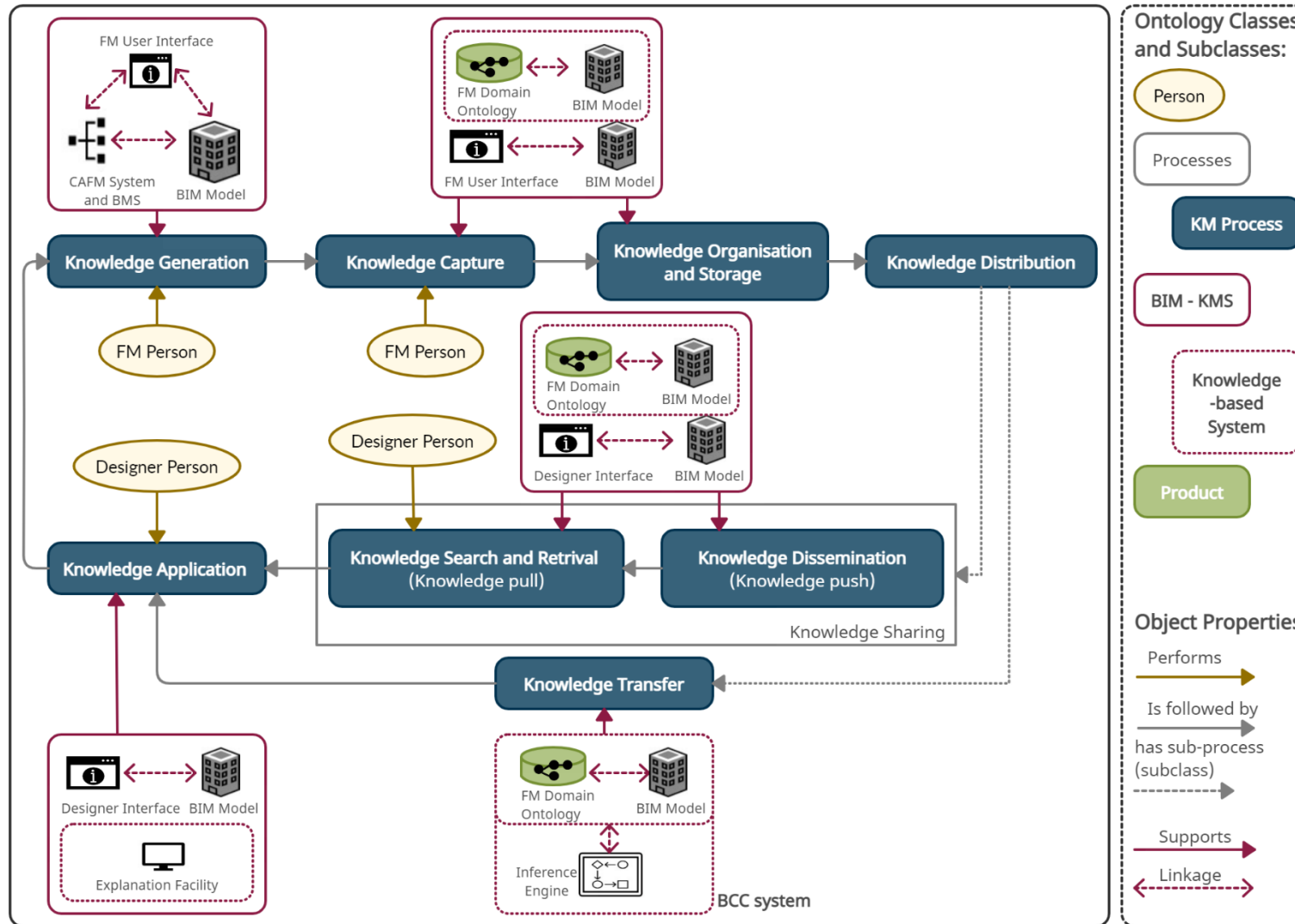
- The KM and KE approach represent different views and different levels of abstractions on developing a BIM-KMS.
- **System Engineering** is an interdisciplinary approach to enable the realization of successful systems or **concepts**.
- Pyramid of system hierarchy is used to **decompose the concept progress** into successive level of details.

# System Engineering Principles in Developing BIM-supported Knowledge Management Systems



- **Enterprise Layer** is based on the principles of **KM**, where an enterprise ontology is developed to represent a **super concept**, that can be used for communication purposes.
- **System Layer** is based on the principles of **KE**, where a domain ontology is developed to systematically represent **domain knowledge**, thus creating a knowledge base.
- **Part Layer** is based on the principles of **KE**, where the knowledge base is implemented in the system, for instance, for **rule-checking purposes**.

# Enterprise Ontology of a BIM-supported FM Knowledge Management System



- **Knowledge Sharing:** dissemination by the sender, **manual** search and retrieval by the receiver.
- **Knowledge Transfer:** the sender is certain that the receiver will **interpret the stored knowledge correctly** while reconstructing and using this knowledge **in a way that the sender intends**.
- **FM Knowledge Transfer** can only be supported by **BIM-based Code Compliance Checking Systems**.

- The development of a BIM-supported Knowledge Management System should be based on the main principles of **Knowledge Management** and **Knowledge Engineering**.
- Based on the principles of KM, a **super concept** should be developed to aid the navigation between the targeted **persons**, **product** and **diverse BIM-supported systems**, and tools.
- **BIM-based Code Compliance Checking Systems** should be seen as **knowledge transfer tools** in the view of Knowledge Management Systems.
- BIM-supported FM Knowledge Management System can aid the integration and validation of **energy efficiency** related **FM requirements** in renovative design decisions.



# Questions?